

Test Beam 2020/03: Preparation Meeting

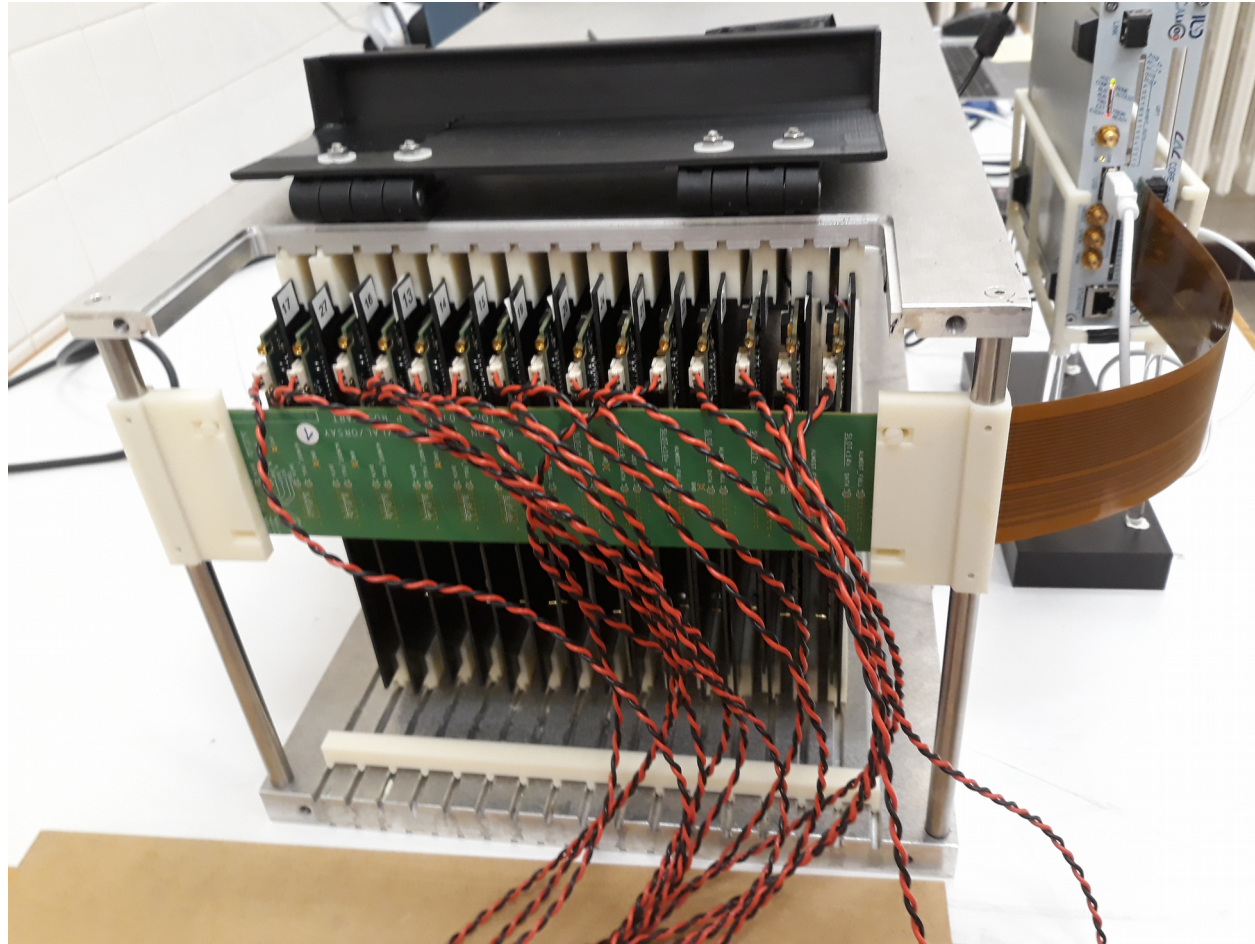


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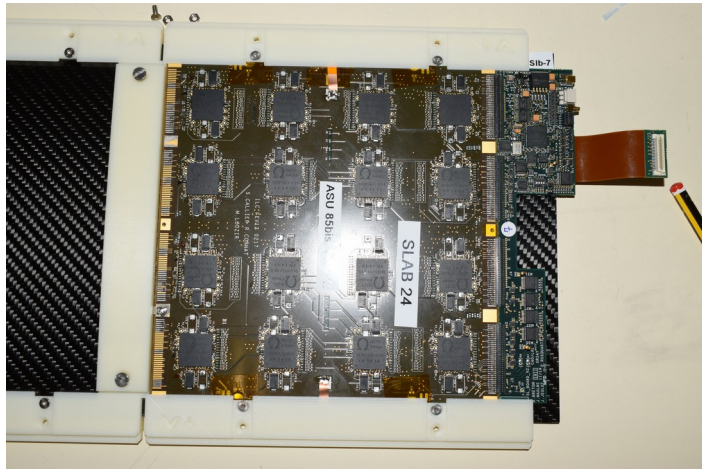
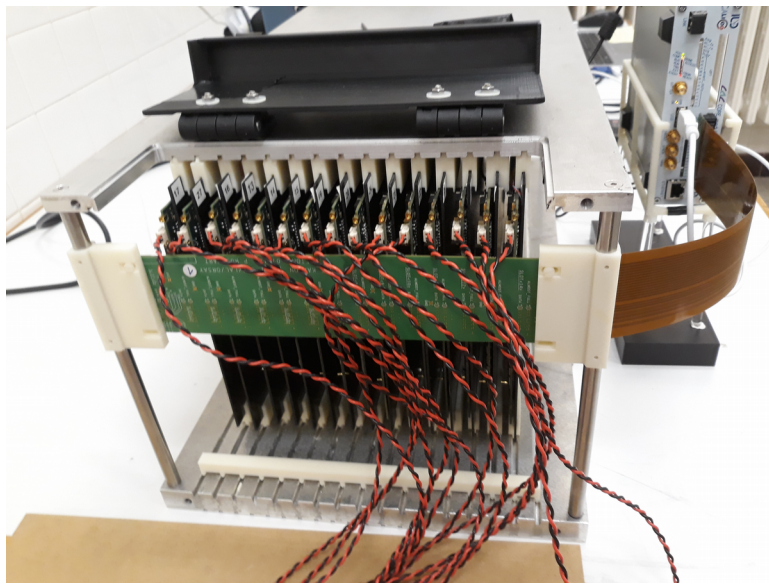


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- ▶ Stack with 15 operative slabs since the end of the quarantine
 - 15000 cells
 - 13824 of them are equipped
- ▶ Some optimization works were needed to make it run
 - For the very first tries we couldn't control more than 8 slabs..
- ▶ Solved by improving the power distribution to avoid tension drops
- ▶ And by optimizing the clock signal propagation through the kapton core
 - By adding the right capacitances in the CoreDaughter (as foreseen)



- ▶ We are ready to go to beam test tomorrow if needed.

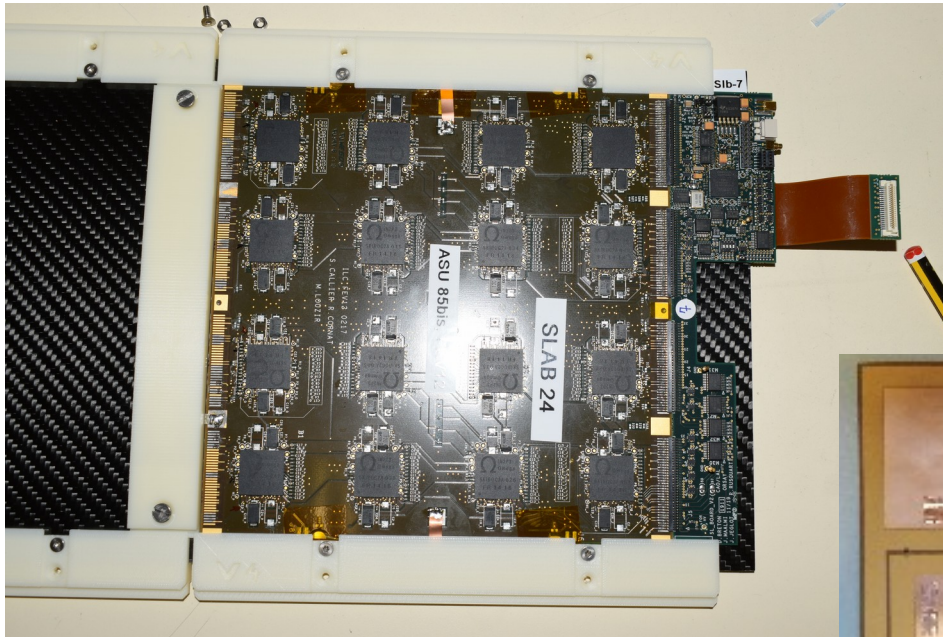
- ▶ For the first time, we have 15 slabs together with common conditions
 - same power supply
 - Same DAQ
 - Same mechanical structure (i.e. same grounding etc)

- ▶ Robust and flexible box!
 - Easy to cable, uncable, remove or swap positions

- ▶ Also robust and flexible slab conception on the carbon frame
 - Easy to access to the chips, soldering points,
 - Easy to plug or unplug from the SLboard

Report on the slabs (I)

- ▶ Due to the COVID, the new HV kapton sheets didn't arrive on time.
- ▶ Therefore, the stack has slabs with two types of HV power delivery.
 - No difference on performance observed so far



Report on the slabs (II)

▶ 4 types of ASUs

- 2 FEV10
- 9 FEV11
- 2 FEV12
- 2 COBs (damaged at Hybrid)

▶ 2 version of SK2

- SK2
- SK2
- SK2a
- SK2a

▶ 2 Si sensor thicknesses

- 320um
- 320um
- 500um
- 500um (only one wafer per ASU)

SLAB status (evolution)

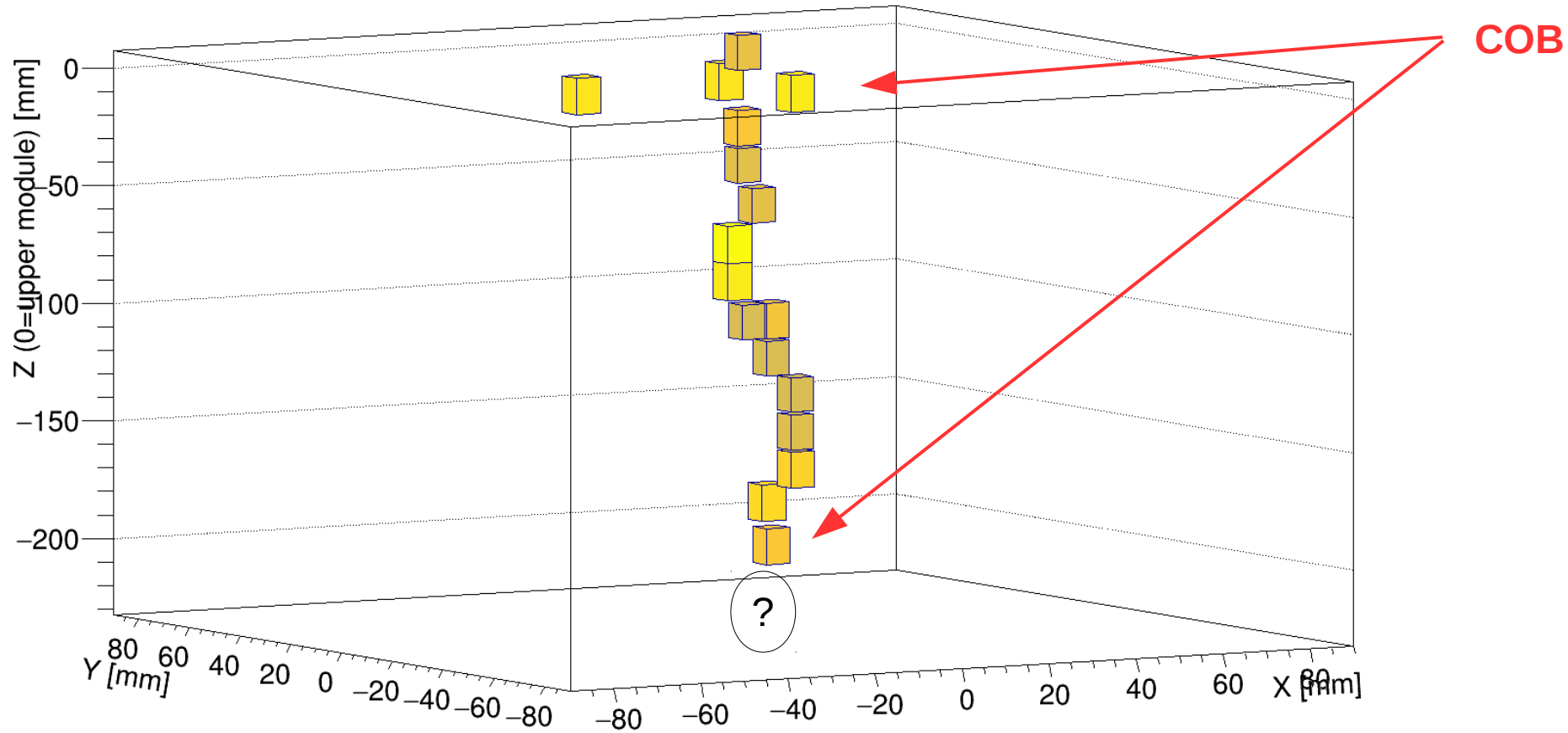
	DESY 2017		CERN 2018		Comments and 2020 status
SLAB	status	calibrated cells	status	calibrated cells	
FEV11	13	0%	0%	0%	Glue spilled in the SMBv. Recovered for 2020
FEV11	14	0%	0%	0%	Error in the SR retour → fixed
FEV10	15	0%	0%	0%	Recovered but without knowing the original issue
FEV11	16	92%	?	?	At CERN : low performance on the corners of the ASU and SMB interface
FEV11	17	93%	95%	95%	Dellaminated wafers !!
FEV11	18	94%	?	?	At CERN : a pattern of lower MIP values is seen in the center of the ASU.
FEV11	19	93%	93%	93%	
FEV11	20	94%	96%	96%	
FEV11	21	54%	0%	0%	Stopped working at DESY 2018. Fully recovered for 2020
FEV11	22	84%	87%	87%	
FEV10	23	0%	0%	0%	FEV10 Never used → operative now.
FEV12	24	0%	0%	0%	New FEV12 (used in 2019)
FEV12	25	0%	0%	0%	New FEV12 (used in 2019)
COB	26	0%	0%	0%	Only one wafer and partially dellaminated → Hybrid Disaster
COB	27	0%	0%	0%	Only one wafer and partially dellaminated → Hybrid Disaster

Commissioning procedure

- ▶ A commissioning procedure has been prepared and carefully tested.
 - Based on the feature of the DAQ software of producing and reading ASCII configuration files
 - Hands-on done
 - Automatizable process (i.e. with EUDAQ)

- ▶ Within ~3h we can tune up a system of 15000 cells and be ready for beam tests
 - For cosmics it takes one or two full days → since we need a much more dedicated masking procedure to cope with the very low rates of signals.

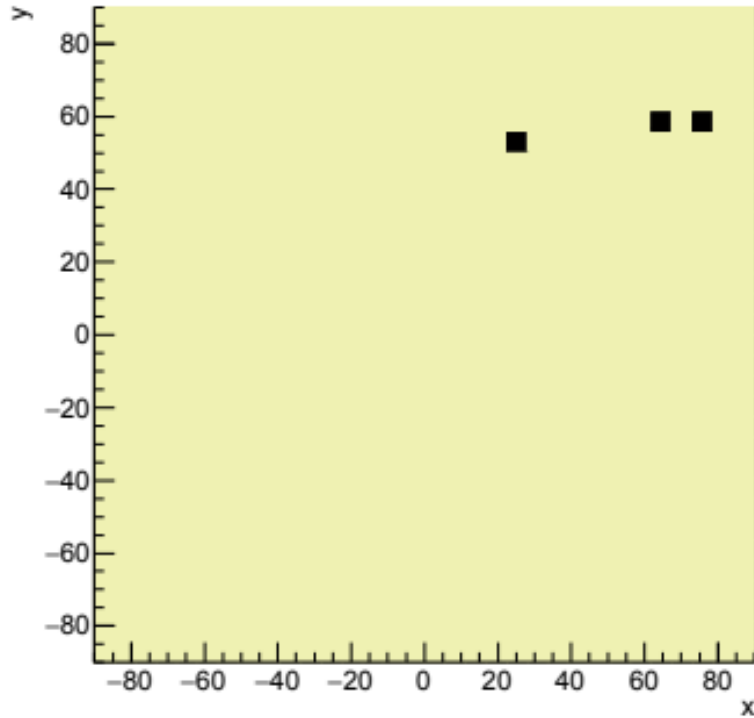
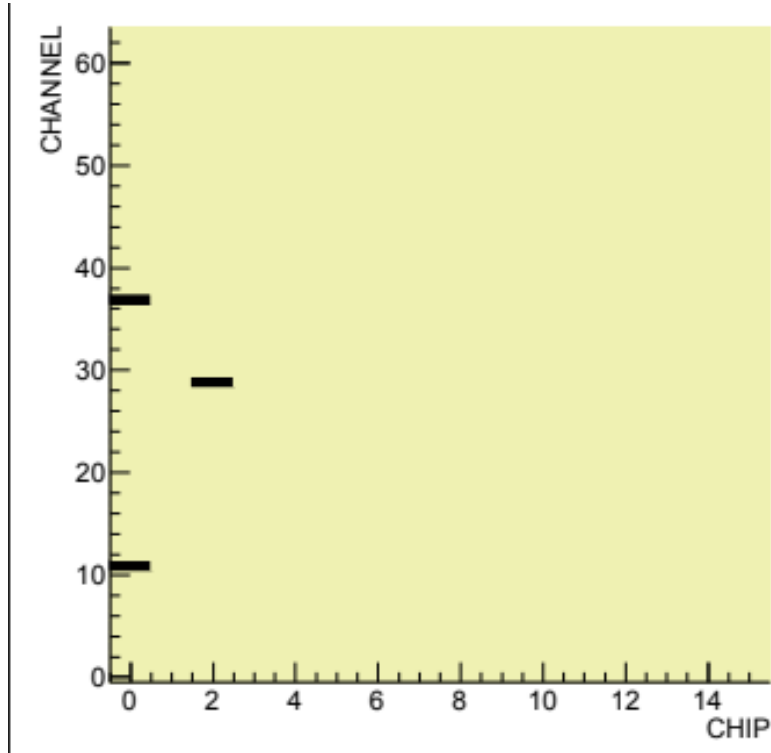
- ▶ All material and tutorials to be uploaded here
 - <https://twiki.cern.ch/twiki/bin/view/CALICE/SiWDESY202011>
 - (work in progress!!)



FEV12: Results of the masking procedure

► SLAB 25 (24 is very similar)

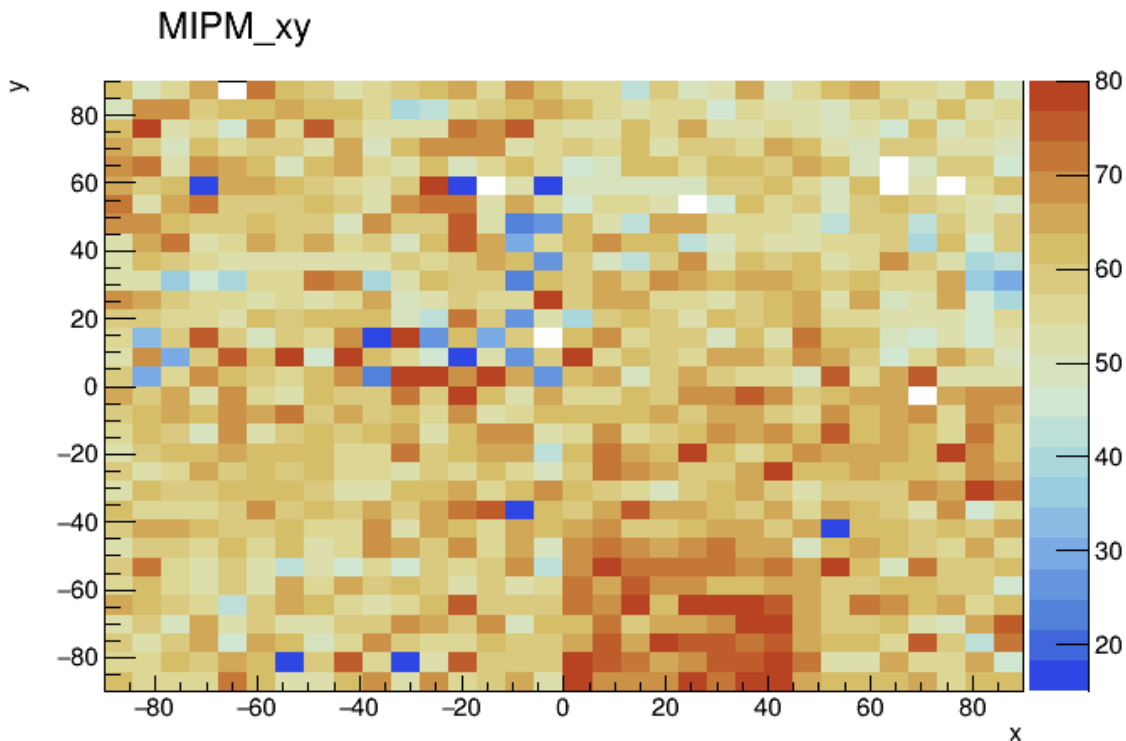
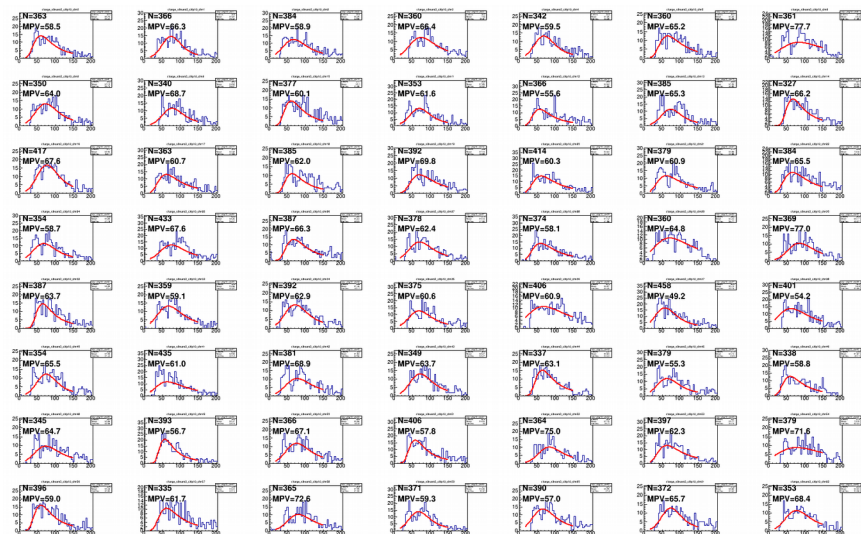
- black is masked



FEV12: Results of the cosmic run

► SLAB 25 (24 is very similar)

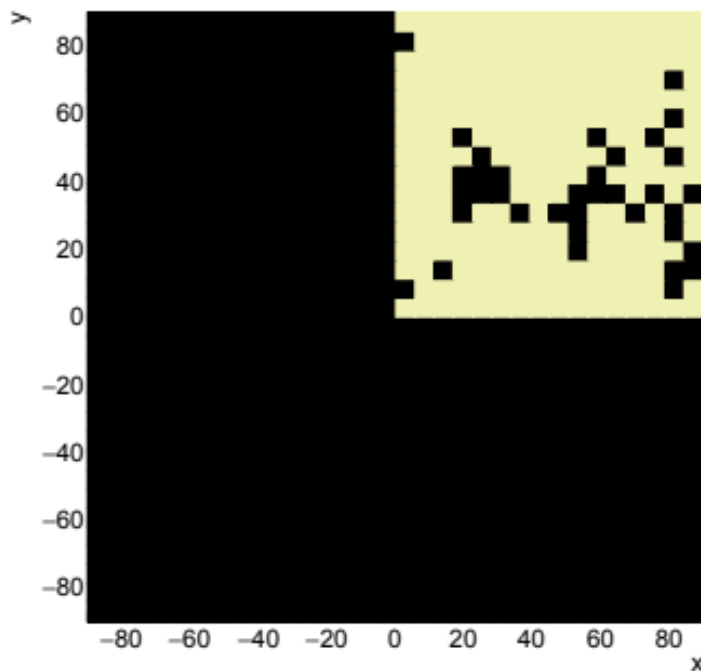
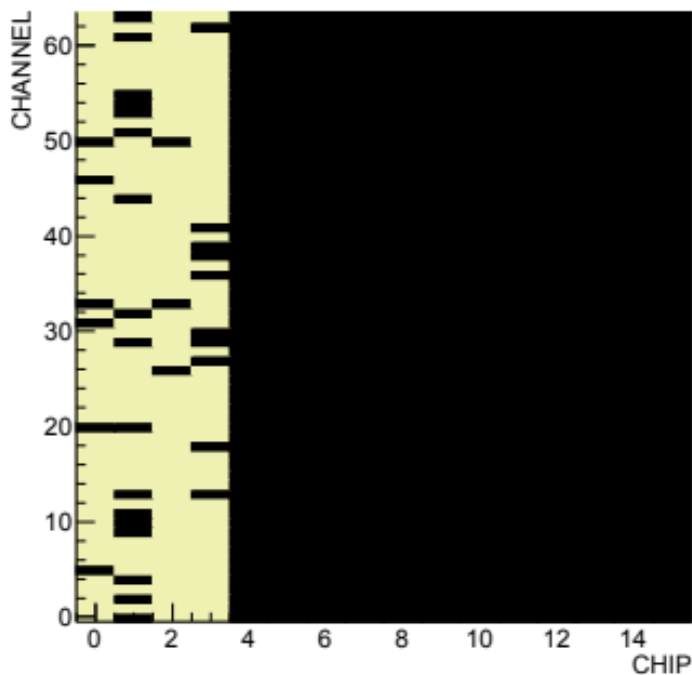
- Quite homogeneous response



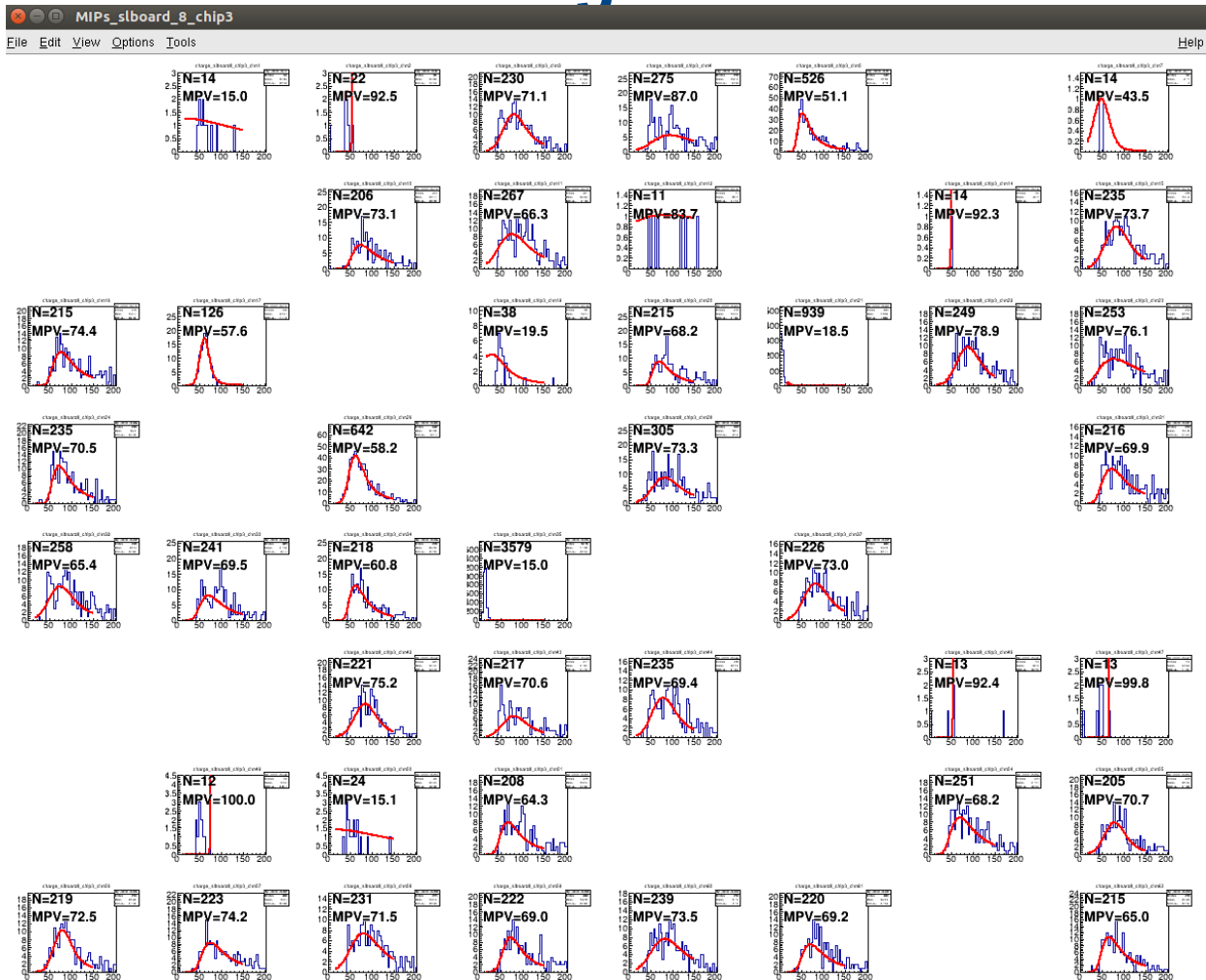
COB: Results of the masking procedure

► SLAB 27 (28 is very similar)

- black is masked
- Remember: the wafer is partially disconnected from the PCB



COB: Results of the cosmic data taking



► SLAB 27 (28 is very similar)

- black is masked
- Remember: the wafer is partially disconnected from the PCB

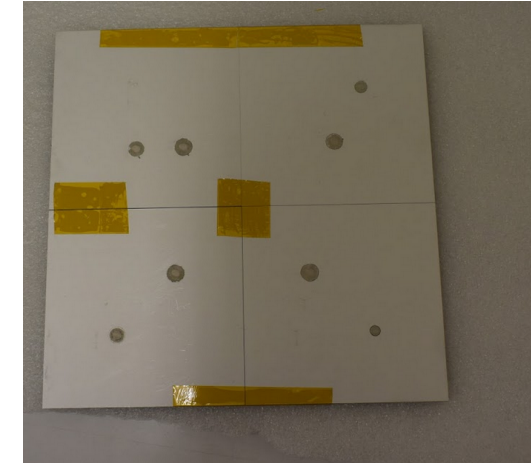
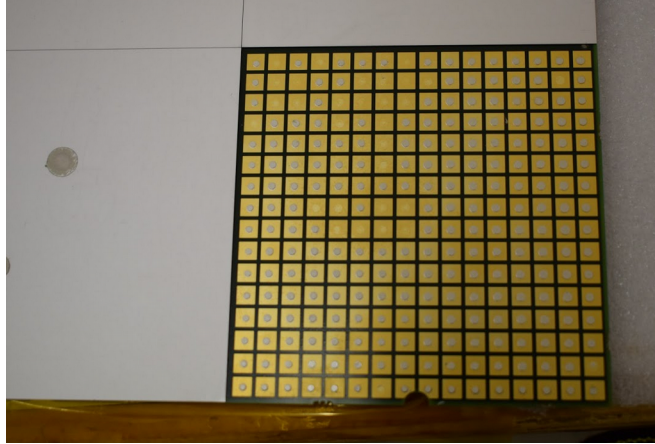
► Some cosmuics... more than I expected after the beating that the board has suffered

- In some cases, we recover the PAD-Wafer contact by mechanical pressure!

A very bad FEV11 → slab 17

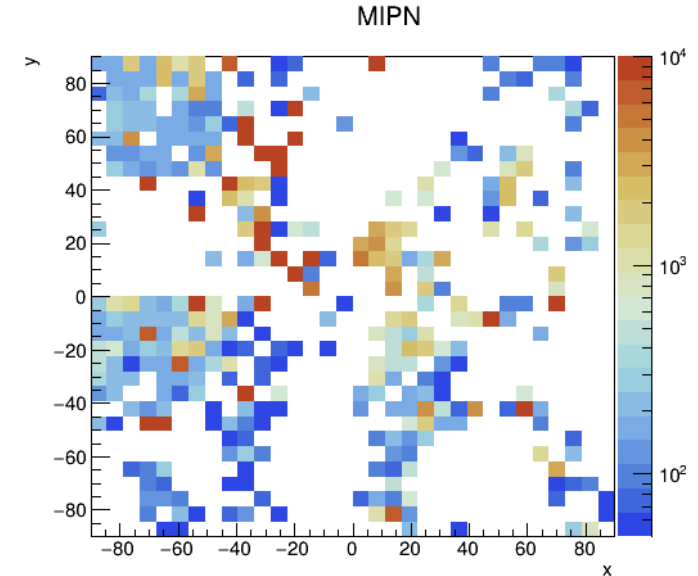
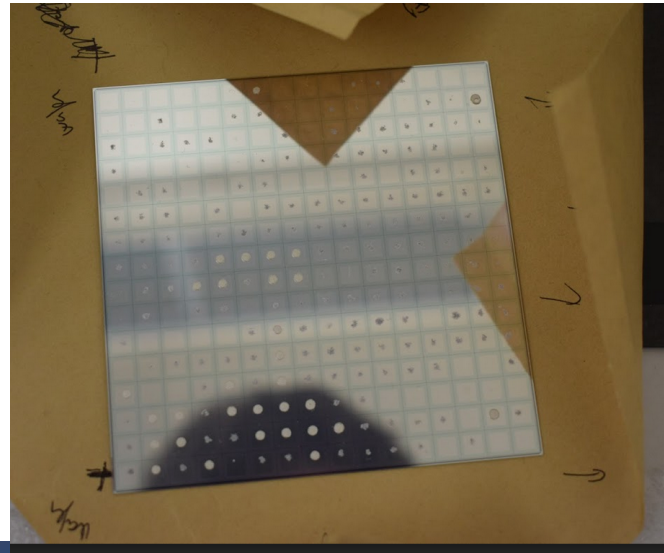
▶ SLAB 17 (FEV11)

- Travel Europe/Japan several times
- Arrived to France just before the quarantine. After several days in customs it arrived to France very well packed and protected.
- However... the wafers were simply partially detached from the PCB. One of them was completely detached.



▶ Some bricolage done trying to recover it...

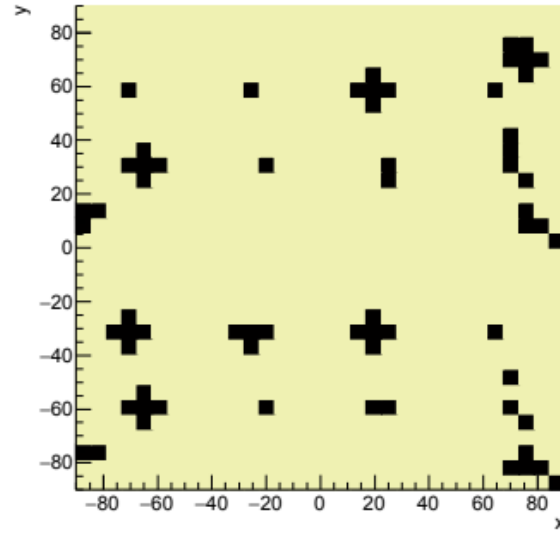
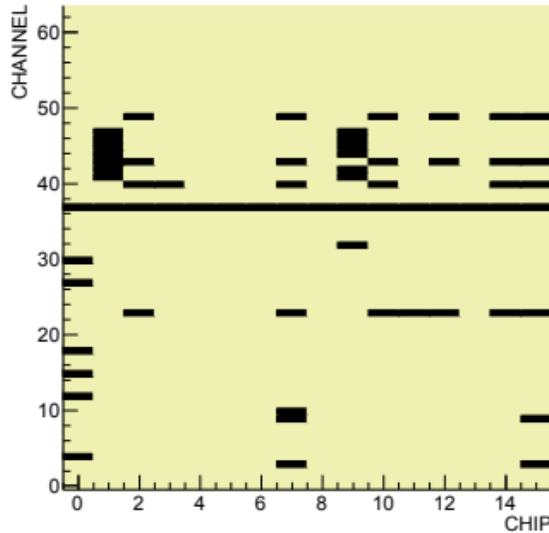
- It is not broken but only few channels are connected.



Standard FEV10/11: Results of the masking procedure

► SLAB 19 (FEV11)

- black is masked
- Crosses are around the channel 37
- Basically the same channels that were masked for TB2017 →
- But few more because we more conservative for cosmic data taking.



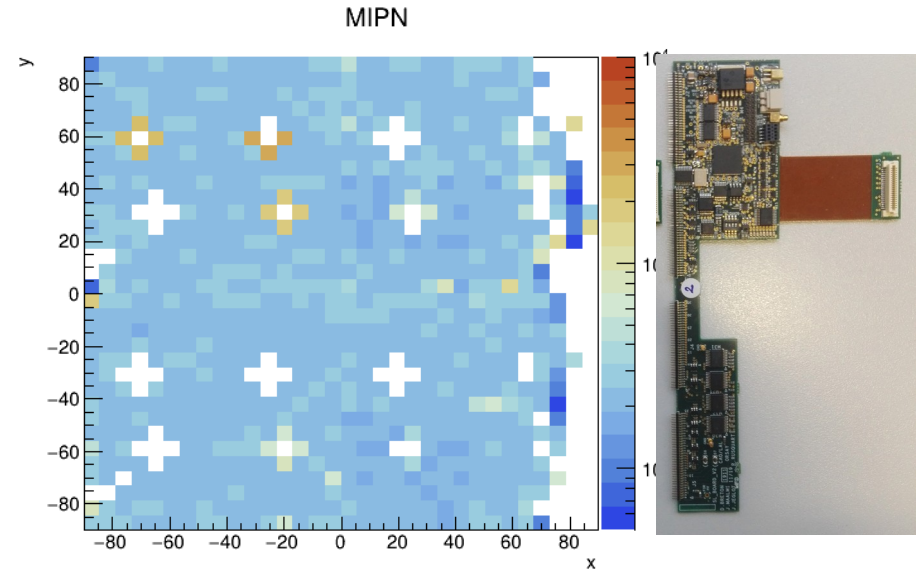
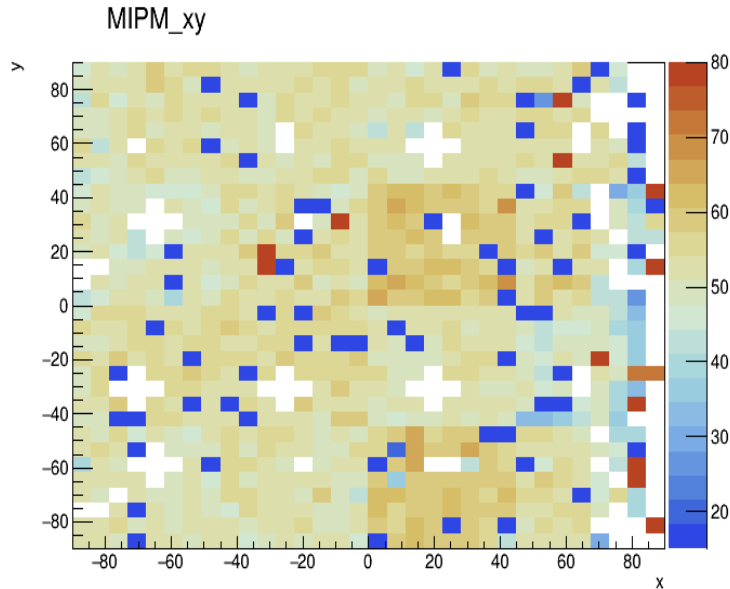
Standard FEV10/11: Results of the masking procedure

▶ SLAB 19 (FEV11)

- Satisfactory results of the cosmic run for most of the slabs

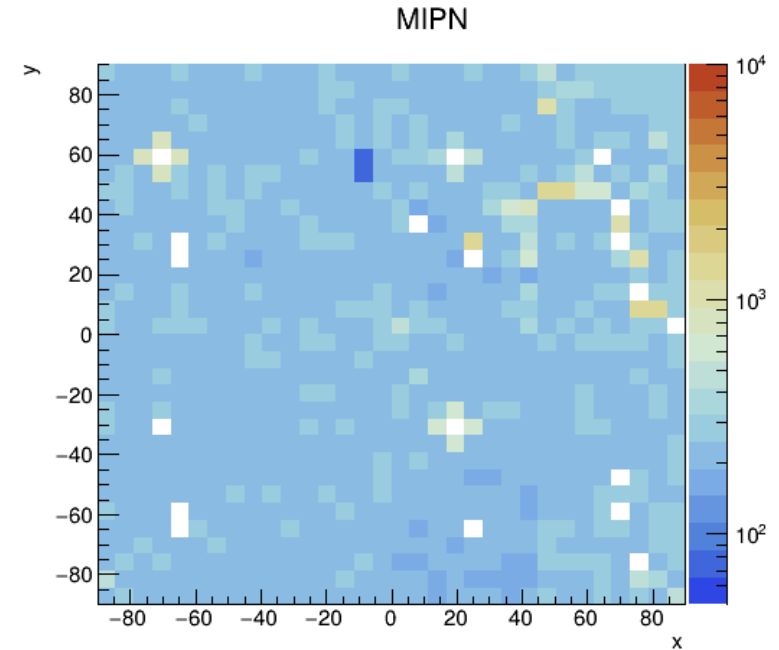
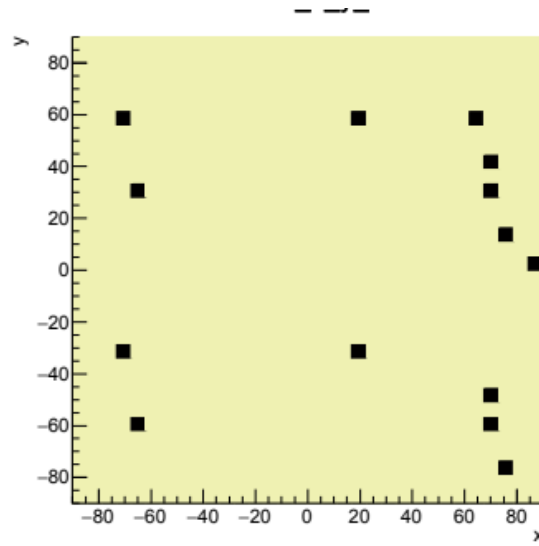
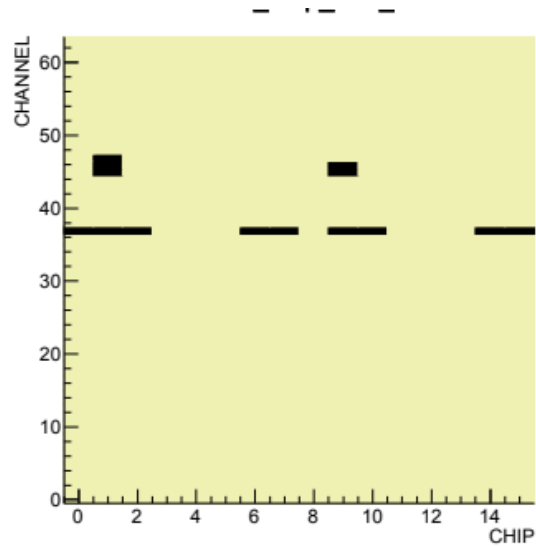
▶ Lower performance on the edges of some boards? Effect seen in the past in several slabs (TB2018 CERN)

- Worst wafer adherence? (i.e. glue aging issue) ?
- Or just a noise/signal competition issue ? → Remember that the ASICs near the connectors are historically the ones much more noise sensitive



A very good FEV10: Results of the masking procedure

- ▶ SLAB 23, SK2, 320um
 - Never connected to a DAQ interface before
 - Similar performance than the FEV12



A very good FEV10: Results of the masking procedure

- ▶ SLAB 23, SK2, 320um
 - Never connected to a DAQ interface before
 - Similar performance than the FEV12
- ▶ Why? Only difference with the FEV11s is on the decoupling capacitances
- ▶ 68uF for DVDD
 - Instead of 33uF in the other FEV10/11
 - Instead of 120uF in the FEV12
- ▶ Can we further optimize the decoupling capacitances?
 - To be tested this afternoon

Components in the ASU

Photos : CHIP capacitances



Comments

- 120uF for AVDD, 68uF for DVDD in all ASICS

Other components : C14, C25, C24, C23, C22, R1, C20, C21 (all chips)

Comments on the masking procedure

- ▶ We are masking between 3-20 % of the channels
- ▶ THIS IS FOR COSMICS!
- ▶ In the first part of the commissioning (the one that assumes short acquisitions and high rates) we expect to mask the same channels than in 2017 (~5%)
 - For the FEV10/11
 - The good FEV10 and the good FEV12 have almost no masking done at this phase (~1% or lower)

Next steps towards the beam test (1)

- ▶ Produce the patch panel
 - On stand-by because of the quarantine
- ▶ Quick tests today on the difference of performance using different values of decoupling capacitances on DVDD
 - If we see that the noise conditions improve considerably...
 - ... do we want to modify the existing slabs? Yes if the interventions are minimal?
- ▶ Incremental optimizations on the mechanical structure
 - i.e. adapt the cover to the “thicker than expected” HV cables

Next steps towards the beam test (2)

- ▶ Continue with the data taking and give continuous feedback to the experts
- ▶ To check the performance stability and/or spot unforeseen issues
 - So far the DAQ software crashed only when I did something stupid...

Data taking Ideas:

- ▶ Study in more detail the time correlations...
- ▶ Prepare more DQ tools
 - i.e. even some tracking/event displays
- ▶ Linearity /pedestal studies
 - I took enough data to repeat these studies systematically
 - Volunteers to analyze the data?
 - We can compare the forced trigger pedestal with the autotrigger pedestal and this one with the pedestal measured by linearity checks...

